



Santa Clara Law Santa Clara Law Digital Commons

Faculty Publications

Faculty Scholarship

7-1-1969

The Legal Frontier in the United States Space Program

George J. Alexander

Santa Clara University School of Law, gjalexander@scu.edu

Follow this and additional works at: <http://digitalcommons.law.scu.edu/facpubs>



Part of the [Law Commons](#)

Automated Citation

George J. Alexander, *The Legal Frontier in the United States Space Program*, 20 SYRACUSE L. REV. 841 (1969),
Available at: <http://digitalcommons.law.scu.edu/facpubs/147>

This Article is brought to you for free and open access by the Faculty Scholarship at Santa Clara Law Digital Commons. It has been accepted for inclusion in Faculty Publications by an authorized administrator of Santa Clara Law Digital Commons. For more information, please contact sculawlibrarian@gmail.com.

THE LEGAL FRONTIER IN THE UNITED STATES SPACE PROGRAM

George J. Alexander*

I shall be discussing problems of domestic law. Since most observations about space law have been made by international lawyers, in whose ranks I am not included, an explanation seems called for. Let me attempt it.

One can understand why scholars who have concerned themselves with emerging space law have focused mainly on international concerns. Most extra-terrestrial problems are at least international in their scope. Nonetheless, a number of significant domestic problems are raised by the broad responsibility given to the National Aeronautics and Space Administration.¹ While the municipal problems of space law may be considerably less dramatic than those involving international law, they are manifold and in some cases more urgent than their international analogs.

Some reasons for the difference between the two types of problems will illuminate the impact of domestic problems. While international problems are subject to international judicial machinery which is cumbersome at best and ineffective at worst,² domestic problems are appropriate subjects of litigation in well established national courts. Indeed, it should be noted that there are both federal and state courts to which persons aggrieved by the space program can turn for relief. Even more significantly, the national courts which exist have little difficulty, in most cases, in enforcing their mandates. International courts suffer again by comparison.³

Principles of domestic law, although not their application to space, are fairly well established. The very existence of established principles often mandates conventional results even after societal changes have obviated the

* Professor of Law and Associate Dean, Syracuse University College of Law. This paper was delivered at the XIth International Colloquium on Space Law on October 18, 1968. It is an outgrowth of a study conducted under a grant to Syracuse University by the National Aeronautics and Space Administration. Under terms of the grant, students of the College of Law at Syracuse University: David Miller, Ross Radley, and John Warsaw did research at field centers. They were assisted by law students at the Kennedy Space Center; Peter Van Allen, a student at the Syracuse College of Law; Steven Rosen, a political science graduate student from Syracuse University; Barry Kelmachar, an Aerospace Engineering graduate student, also of Syracuse. To all of these gentlemen I am indebted for the data summarized in this article.

1. The Congress declares that the general welfare and security of the United States require that adequate provision be made for aeronautical and space activities. The Congress further declares that such activities shall be the responsibility of, and shall be directed by, a civilian agency exercising control over aeronautical and space activities sponsored by the United States. . . .

National Aeronautics and Space Act, 42 U.S.C. § 2451 (1964).

2. G. MAGONE, *THE ELEMENTS OF INTERNATIONAL LAW* 353-355 (1967).

3. *Id.* at 202.

original rationale. Precedent being what it is, decisions in prior cases govern courts although the facts are only partially applicable to current circumstances. This provides a fairly rigid framework for decision.

In this respect, international law, in the new field of space especially, is far less constrained. Though academics belabored⁴ and continue to belabor⁵ the question of territorial right to super-adjacent space, the advent of Sputnik and its space successors through Apollo XI have changed customary international law and left them behind by establishing the principle of free use of outer space⁶ although leaving the demarcation line as yet undefined.⁷ If domestic laws were as pliable, far fewer problems would exist with the national space program.

Domestic law has an even more pronounced impact on the space program because N.A.S.A. is a civilian agency rather than a branch of the military. The decision to put the space program in civilian hands is fully in accord with the international agreement to keep outer space from becoming part of the arms race.⁸ It is also consonant with principles of domestic politics by implementing the general desire to prevent a greater growth of military power than is required. This should certainly not be interpreted as a criticism of that decision. The point is that a civilian agency has, in our legal scheme, considerably less authority than does the military. To mention just a few of the significant distinguishing features: armed forces activity can be justified from a constitutional standpoint, by the Congressional power to make war.⁹ In times of emergency that power may seem paramount, providing not only the ability to act, but, to some extent, to act in the face of other constitutional mandates.¹⁰ No comparable constitutional grant of authority to Congress governs the space program. Congressional legislation dealing with space must, in consequence, look to more traditional

4. Cooper, *High Altitude Flight and National Sovereignty*, an address delivered in Mexico City, Jan. 5, 1951. Republished in *Legal Problems of Space Exploration: A Symposium*. S. Doc. No. 26, 87th Cong., 1st Sess. (1961).

5. Cooper, *Contiguous Zones in Aerospace - Preventive and Protective Jurisdiction*, *Symposium on the Law of Outer Space*, 7 A.F. J.A.G. L. REV. (No. 5) 15 (1965).

6. "Outer space and celestial bodies are free for exploration and use by all states on a basis of equality and in accordance with international law," *Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space*, Section 2, G.A. Res. 1962 (XVIII) Dec. 13, 1963 [hereinafter cited as *Declaration on the Exploration and Use of Outer Space*]. The provision is now included, in similar language, in Article II of the *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies*, G.A. Res. 2222 (XXI) Dec. 19, 1966 [hereinafter cited as *1966 Space Treaty*].

7. C. JENKS, *SPACE LAW* 189-91 (1965).

8. 1966 *Space Treaty*, art. III.

9. U.S. CONST. art. I, § 8, cls. 11-16.

10. See, e.g., Rostow, *The Japanese-American Cases—Disaster*, 54 *YALE L.J.* 489 (1945).

constitutional provisions such as the commerce clause¹¹ for legitimation.¹² Commerce power has its limits and does not preclude the use of state authority over intrastate commerce, at least to a limited extent.

The military has been allowed a necessary degree of secrecy. Until defense considerations change considerably, one would expect the cloak to remain and thus expect a number of legal problems to be obscured. On the other hand, N.A.S.A. in its civilian program, both as a matter of law and of policy, is an open agency¹³ which could not hide its legal problems if it cared to. This has become even more evident with the passage of the Freedom on Information Act¹⁴ which will be discussed at a later point.

Another distinguishing feature between the military and N.A.S.A.'s civilian role is the loyalty and performance level required of personnel. It is generally recognized that Armed Forces personnel owe a legal duty of loyalty and an obligation of service which is drastically different from that owed by civilians merely employed by a government agency. Both legally and pragmatically, in consequence, N.A.S.A. must deal with its labor needs in a far more circumspect manner than the Armed Forces. This also will be commented upon at a later point.

Neither the press of domestic law nor the inapplicability of military authority distinguishes N.A.S.A. from the great bulk of governmental operations. Consequently some of the problems faced in the space program are quite comparable to problems faced by other civilian departments of government. It is incorrect to assume, however, that these superficial similarities between N.A.S.A. and the older departments of government leaves the Administration in a comparable legal position. Most other departments have existed longer and consequently have had a much greater opportunity to work out their own legal problems over time. Except for the Atomic Energy Commission which, like N.A.S.A., is a relative new-comer to the administrative field, the other agencies have dealt with principles fairly close to conventional principles of domestic law. Most agencies have not had to grapple with great leaps of technological information which alter prior concepts, nor have they been under the time pressures which have

11. U.S. CONST. art. I, § 8, cl.3.

12. While one could argue that the commerce clause does not expressly authorize Congress to deal with matters of outer space at all since space is not strictly either interstate commerce, foreign trade, or trade with Indian tribes, the expansion of commerce authority leads one to believe it is sufficient to allow Congress to pass legislation concerning space.

13. Information obtained or developed by the Administrator in the performance of his functions under this chapter shall be made available for public inspection, except (A) information authorized or required by Federal statute to be withheld, and (B) information classified to protect the national security

National Aeronautics and Space Act, 42 U.S.C. § 2454 (1964).

14. Freedom of Information Act, 5 U.S.C. §§ 552, 553 (1967).

plagued the Aeronautics and Space Administration since its inception and more particularly since President Kennedy announced the goal of a lunar landing in this decade.¹⁵ The press of time and the press of technology, as well as the fact that the legal problems have often raised issues not previously decided, have combined to make legal work in the Administration different from, and somewhat more complex than, administrative work in other government agencies.

II

If economics is a dismal science, law is a dismal art. Legal constraints do not come into consideration while things run smoothly. Thus a visit to one's lawyer is as much a harbinger of ill times as is a visit to one's psychiatrist. It is a sign of the good fortune of the space program that N.A.S.A. has not been forced fully to explicate its legal obligations. In discussing briefly what I consider those obligations to be, let me not be understood to be a prophet of doom, but merely a professional in a field which unfortunately is trained to look at the dim side. As I have said, to date the space program has operated with extremely happy results as far as personal injury and physical damage is concerned. Considering the explosive potential of the highly volatile fuels massed in tremendous quantities in space centers it seems close to miraculous that there have been relatively few instances of physical injury, the most dramatic physical injury so far occurring as a result of an ordinary fire aboard a spacecraft. Launch vehicles have not returned intact to earth as explosive missiles. Space junk has on the whole fallen at sea and, so far as I know, when it has fallen on land has caused no personal injury and only limited property damage. It is not a setting designed to make one overly concerned about life or property but the potential that exists is ominous indeed. Furthermore, impact damage is not the only form of harm which may be caused. The space program makes demands on communications, the use of property and on other areas which need to be calculated into its effect on others.

Let me list the obligations which I believe to be the most important without suggesting that there is any particular order to their importance. There is the obvious obligation on the part of the employer to provide his employees (the astronauts and others) with as safe a place to work as is reasonable under the circumstances. This requires providing safe working conditions for the terrestrial members of the space team and, beyond that, providing assurance that those in space complete their journey as safely as possible.

A correlative obligation requires N.A.S.A. to insure that the activities of

15. 107 CONG. REC. 8271 (1961) (remarks of President Kennedy).

others do not endanger the safety of astronauts. By treaty the United States has now committed itself to a concern about the astronauts of other nations whose safety they should also guard.¹⁶ These responsibilities require arranging accommodations with incompatible operations of other business and with private uses during times of space flight so that nothing done on the ground interferes with United States operations in space. Some difficulty has already been experienced in this area, as I will point out later. Although no express treaty provision obligates us to take similar measures for space adventures of other countries, there is at least a moral obligation to insure that no domestic activity unduly endangers space missions whatever their origin. The government is obligated, again by international treaty provision,¹⁷ to return space property to foreign countries in the event of its impact in the United States; and the United States will undoubtedly want to recover a good deal of its own.

N.A.S.A. shares with other employers the general obligation not to endanger populated areas. Again, the domestic obligation has an international counterpart.¹⁸ N.A.S.A.'s obligation to protect life is distinguishable from a similar obligation of other employers by the complexity of assuring safety over the extensive area that is potentially in danger.

Similarly, there is a national and an international obligation to preserve property from accidental destruction and, presumably, to compensate for it in the event that it is impossible to avoid destroying it.¹⁹ In the event of a major domestic catastrophe one would think that the government as a principal in the space business would have an obligation to provide relief, perhaps irrespective of its degree of fault. The extent of the international obligation is still being debated.²⁰ If not in its capacity as a principal, then certainly as the government of the country, some form of domestic relief from the United States would seem appropriate.

16. 1966 Space Treaty, art. V.

17. 1966 Space Treaty, art. VIII.

18. 1966 Space Treaty, art. VII.

19. Where a person acts to protect a strictly private interest, which caused loss, recovery has been allowed. *Vincent v. Lake Erie Transportation Co.*, 100 Minn. 456, 124 N.W. 221 (1910). See Restatement, Torts § 263. See also Bohlen, *Incomplete Privilege to Inflict Intentional Invasions of Interests of Property and Personality*, 39 HARV. L. REV. 307 (1925). But where defendant acts to protect a public interest, he may be privileged. No recovery was permitted in *Surocco v. Geary*, 3 Cal. 69 (1853); *Russell v. Mayor of New York*, 2 Denio (N.Y.) 461 (1845). But to claim necessity as a defense, the actor must bear the burden of showing an emergency or other situation. *Hicks v. Dorn*, 42 N.Y. 47 (1870). See Hall and Wigmore, *Compensation for Property Destroyed to Stop the Spread of Conflagration*, 1 ILL. L. REV. 501 (1907).

20. See Dembling and Arons, *Space Law and the United Nations: The Work of the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space*, 33 J. AIR L. & COM. 329, 349-71 (1966).

Somewhat more conjectural is the obligation of N.A.S.A. in its own right, or as an agency of the general government, to provide good samaritan service. The demands of the space program have generated a good deal of life-saving equipment, some in the form of technological advancement, some in the form of medical machinery not generally available and some in the form of disaster control equipment. Having the capacity to assist in the relief of suffering not of its own making, one might wish to see N.A.S.A. accept the obligation of making its excess capacity generally available. Somewhat more concretely, there is the obligation, by international agreement, not to pollute outer space²¹ and the obligation under domestic law not to pollute the United States by bringing back contamination from space.²² There is a similar obligation to engage in the space venture not for national profit but for the general benefit of all mankind.²³ Not all of these obligations are legally enforceable. For example, the good samaritan use of government equipment can probably not be enforced. The international obligations are left to the vagaries of international enforcement. However, some obligations can be enforced in domestic courts and others appear to provide a good basis for consideration by domestic courts.

III

Let us now turn to the impact of domestic law on some of these obligations. In our society, private property rights are of extreme importance—personal property interests tend to be both vested and exclusive. While considerably more amenable to federal intervention for the public welfare than they were during the 1930's,²⁴ such rights still find a good deal of support in judicial action. Before the space program was an actuality, private rights in property had been trimmed from their dramatic common law limits wherein one owned a vector beginning at the center of the earth, running through his property and extending infinitely into outer space.²⁵ Accommodation of manned flight and property rights was completed before space activity began, though some questions remained about the extent of ownership of the space immediately adjacent to private property. It has been established that most of what lies above the land owner's property belongs either to the nation,²⁶ or, at higher levels, to no one at all.²⁷

The current development of space activity has not yet necessitated a

21. 1966 Space Treaty, art. IX.

22. Public Health Law, 42 U.S.C. § 264 (1964).

23. 1966 Space Treaty, art. IX.

24. *Diminishing Property Rights*, 69 W. VA. L. REV. 170 (1967).

25. *Hannabalsen v. Sessions*, 116 Iowa 457, 90 N.W. 93 (1902).

26. Klein, *Cujus Est Solum Ejus Est . . . Quousque Tandem?* 26 J. AIR L. & COM. 237 (1959). See generally W. PROSSER, *LAW OF TORTS* 70 (3rd ed. 1964).

27. Cooper, *High Altitude Flight and National Sovereignty*, *supra* note 4.

further accomodation, but with the advent of increased supersonic travel N.A.S.A. may soon find itself at least tangentially embroiled in the legal problems arising out of the creation of sonic boom with its consequent damage. Sonic boom is a pedestrian problem of the space age. It smacks very much of older problems caused by subsonic flight. It is, in any event, to be a comparatively short-lived problem because, inevitably, the hypersonic transport will succeed the supersonic transport and present expectations indicate that (whatever the form of the hypersonic transport) the H.S.T. will at least use air space sufficiently removed from the earth surface to avoid the excessive over pressure presently associated with supersonic flight. Nonetheless, perhaps because of its pedestrian qualities, the supersonic transport is an excellent starting point in examining governmental responsibility for the space program.

Supersonic flight has interfered with private property rights in several distinct ways. The most obvious is the physical damage caused by the sonic boom itself which has shattered glass, cracked plaster, and the like. In addition, even where physical damage has not resulted, interference with the free enjoyment of private property has been caused by the loud noise associated with sonic boom and the vibration caused in homes. Sonic boom has also caused apprehension of physical collapse though collapse has not occurred.

The Armed Forces, which to date possess a monopoly in supersonic flight, have been somewhat chary of paying sonic boom claims.²⁸ Their policy has been most liberal with respect to physical damage actually inflicted. Even here, some claims have been resisted on the grounds that the Federal Tort Claims Act²⁹ does not impose liability since it preserves certain discretionary functions from the general waiver of sovereign immunity.³⁰ Beyond that there has been a demand for a demonstration of causation which appears to have been beyond the ability of a number of plaintiffs. Aside from physical damage claims, to my knowledge no compensation has been paid in any sonic boom instance for either the apprehension caused by noise or for the annoyance and interference to property owners.³¹

Curiously, the private land owners most benefited by present law, assuming substantial interference with their enjoyment of their property, are those located most closely to the airports. Where the air space is most clearly violated, the federal Constitution appears to mandate compensation

28. Maness, R.W. (Maj.-Gen. USAF), *Effect of Airborne Disturbances*, American Institute of Aeronautics and Astronautics Paper No. 68-920 (1968).

29. 28 U.S.C. §§ 1291, 1346, 1402, 1504, 2110, 2401, 2402, 2411, 2412, 2671-2680 (1964).

30. 28 U.S.C. § 2680 (1964). See *Bartholomae Corp. v. United States*, 135 F. Supp. 651 (S.D. Cal. 1955).

31. *Supra* note 28.

for the taking by inverse condemnation.³² Even here, the law may compensate more for the use of air space than for the consequential annoyances caused by air traffic.³³ Recently, a New York Court of Appeals decision suggested an advance in the law which may well expand non-physical damage cases. In a condemnation case, in which land was taken to build a highway, the court of appeals required payment of an additional sum to compensate the landowner for the increased noise caused by the new highway. In so doing, the court departed materially from prior cases which had suggested that additional noise would not be considered a taking since noise increase was not compensable to other landowners.³⁴ While the court specifically eschewed creating a cause of action on the general theory of a condemnation by increase in noise the decision could turn out to be a harbinger of just such a new claim. As the dissenters pointed out, it seems inequitable to allow adjacent landowners to be compensated while others suffering similar noise damage are not.

Were private enterprise to come into a neighborhood with a new form of business and cause interference, either by noise level or by physical invasion, it seems likely that it would be required either to cease operation or, if that were undesirable, to compensate for the loss caused. While it is possible to avoid this result using the sovereign immunity of the federal government and the "governmental purpose" doctrine³⁵ as defenses, one wonders what societal policy is furthered by requiring the loss to be borne by a small group of innocent landowners while the beneficiaries are the people of the entire country. It would seem sounder to tax all beneficiaries by requiring the government to respond through compensation of damage caused either by physical invasion or by otherwise decreasing the enjoyment of private property.

The supersonic transport, because it comes close to prior tort cases, seems an appropriate place to make a beginning. Statutory authority exists allowing the N.A.S.A. administrator to make payment for damage caused by N.A.S.A. functions.³⁶ Where interference is only slight and occasional one would expect the principle of *de minimis* to prohibit any recovery.³⁷ Other cases ought not to be too financially burdensome to N.A.S.A., especially since operational control will devolve to others. The other governmental agencies involved should likewise be prepared to reimburse loss.

It should be noted at this point that a number of municipalities have

32. U.S. CONST. amend. XIV; *Griggs v. Allegheny County*, 369 U.S. 84 (1962).

33. R. Anderson, *Some Aspects of Airspace Trespass*, 27 J. AIR L. & COM. 341 (1960).

34. *Dennison v. State*, 22 N.Y.2d 409, 293 N.Y.S.2d 68, 239 N.E.2d 708 (1968).

35. See generally W. PROSSER, LAW OF TORTS ch. 27 (3rd ed. 1964).

36. National Aeronautics and Space Act, 42 U.S.C. § 2473(b)(13) (1964). See also 28 C.F.R. §§ 14.1-14.11 (1969).

37. W. PROSSER, LAW OF TORTS § 30 (3rd ed. 1964).

become extremely concerned about the effect of air transport on private property and have attempted themselves to achieve regulation; as will later be noted, they have not been successful but their efforts should again illustrate the need. The government should, I believe, adopt a compensation scheme in advance of further confrontation. Conversely, the need to use air space and the need on occasion to expose populated areas to sonic boom should be recognized as reasonable acts of government in the development of the important aerospace sector of our national effort. No argument is advanced here that government does not have a right to partially take from private landowners if the taking is needed for the space program. The only argument made here is that, as in the case of the taking of real property for aviation easements, the government ought to be prepared to pay for what it gets.

Whether such an obligation exists is presently being tested in litigation arising out of what to my knowledge is the first domestic injunction against terrestrial activities to protect activities in outer space. During the Gemini 7 flight on December 6, 1965, the Rodd Field Tracking Station in Corpus Christi experienced interference with its tracking function. The interference was traced to electrical signals emanating from, among other things, the spark plugs in trucks of a private corporation on its own property adjacent to Rodd Field. Although the company had previously complied voluntarily with Space Administration requests not to operate its equipment during space flights, it refused to comply further without compensation during the extended Gemini 7 flight. On December 7th, the government sought and obtained a temporary restraining order prohibiting the operation of equipment capable of generating electrical signals including the company's trucks. Shortly thereafter the preliminary restraining order was converted to a temporary injunction. The court found that a mandate was required against the company's operations in the interests of the safety of the astronauts who were circling in space above the site. Defendant's company was shut down during the operation of the tracking station and the mission was successfully completed.

Other companies in the area were also threatening the tracking capabilities of the Corpus Christi station. In their case, a prohibition against interference was accomplished, earlier in 1965, by the passage of an amendment to the Texas Airport Zoning Act of 1947 which was signed into law in May of 1965.³⁸ The amended act zoned tracking stations with the airports for purposes of radio interference control. The company involved in the injunction and several companies affected by the prohibitions of the Airport Act have brought suit seeking to be compensated for the loss occasioned by the limitation of their industrial activity. Those cases still pend. Without attempting to prognosticate about their outcome, it would

38. TEX. CIV. ST., VERNON'S ANN. CIV. ST. art. 46e-1 (1969).

seem again that in cases of this sort a taking of substantial private interest is involved for which the general public might more appropriately respond than the few companies directly affected.³⁹

As was true of the supersonic transport illustration, the ground is again familiar. The advent of the airplane caused a number of similar problems to be resolved with respect to airports of a less unique type. There, on the whole, non-conforming uses pre-existing the airport designation have been allowed to continue and any required modification has been treated as a compensable taking.⁴⁰ Similarly, it has become established that incidental damage is also a compensable taking.⁴¹ Law as well as equitable consideration seem to point in the same direction.⁴²

A related type of problem exists in N.A.S.A.'s need to enter private property and recover remnants of space missions whether of domestic or foreign origin. Rescue operations for downed astronauts are also a distinct possible future need. Far more pressing, however, in light of prior developments, is the need to enter property to recover unmanned space vehicle portions. Not only may the Administration itself have need of the objects for testing or to recover still useful equipment, but it may have to recover them to satisfy the United States obligation under international treaty⁴³ to return, if practical, space objects launched by foreign nations. It is clear that the property interest in space objects is not lost either to other nations⁴⁴ or to the United States⁴⁵ by the launching of vehicles into outer

39. It is assumed in this discussion that the use of the equipment causing the radiation interference does not violate an F.C.C. regulation which is arguably relevant, 47 C.F.R. § 15.31 (1968): "An incidental radiation device shall be operated so that the radio frequency energy that is radiated does not cause harmful interference. In the event that harmful interference is caused, the operator of the device shall promptly take steps to eliminate the harmful interference." The general problem may be resolved by an amendment to the F.C.C. act presently proposed which would regulate the production of devices capable of causing radio interference. *Hearings on H R 14910 Before a Subcomm. on Communications and Power of the House Comm. on Interstate and Foreign Commerce*, 90th Cong. 2nd Sess. (1968), having expressly the Corpus Christi incident as the reason for requiring the legislation.

40. "Generally, a zoning ordinance . . . [for an airport hazard area] which limits the uses of private property by exercise of the police power must operate prospectively only. *Minneapolis-St. Paul Metropolitan Airports Comm'n v. McCabe*, 135 N.W.2d 48, 55-56 (Minn. 1965).

41. *Sax, Takings and the Police Power*, 74 YALE L.J. 36, 67-69 (1964). See also *The Validity of Airport Zoning Ordinances*, 1965 DUKE L.J. 792, 798-804.

42. But see *Bennett v. United States*, 266 F. Supp. 627 (W.D. Okla. 1965), (sonic boom test did not constitute the taking of an aviation easement). Compare *Todd v. United States*, 292 F.2d 841 (Ct. Cl. 1961), (fisherman compensated for loss of licensed fishing ground because of military restrictions).

43. *Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched in Outer Space*, G.A. Res. 2345 (XXII), Dec. 19, 1968 [hereinafter cited as *Rescue and Return of Astronauts and Space Objects Treaty*].

44. 1966 Space Treaty, art. VIII.

45. *Id.*

space and their return to earth. It is less clear that legal authority exists, at this point in time, to enter private land to repossess property. If one were to apply common law real property concepts without modification, the right to entry for repossession might well be denied. While at common law one was privileged to trespass on private property, to recover his possessions (subject to liability for harm caused) when those possessions came on the land innocently or by natural tendency,⁴⁶ no similar privilege attended a person whose property came on realty as a result of his own wrong-doing.⁴⁷ We are, of course, loathe to consider the space program an act of national wrong-doing in a normative sense, but it should be recognized that the activity of blasting missiles into space would most likely find its common law analog in early explosive cases. In those cases it was fairly clear that the resultant physical impact on private property was a "wrongful" act in the sense that it required compensation.⁴⁸

It is unnecessary to discuss the common law cases, clearly distinguishable on their facts, and to some extent on their theory, from the present situation.⁴⁹ Should the need arise to obtain space particles, it seems unlikely that landowners would resist and even less likely that a court would prohibit the government's entry for the purpose of retaking possession. Nonetheless, because of the cloud on the government's right and because of the need for an orderly system for what may become a more common activity in the future, it would seem desirable for Congress to pass enabling legislation that would both specify procedures for the recovery of space particles and provide for compensation for any harm to the land as a result of the search for, or as a result of the impact of, the missile. The costs for the recovery of foreign launched vehicles, it should be noted, would be borne by the launching country under the provisions of the space treaty.⁵⁰

Along the same lines, N.A.S.A. probably ought to have authority to obtain all objects which fall from outer space for purposes of examination and investigation. In this respect they could cooperate as well with the Department of Agriculture which has quarantine authority⁵¹ over possible contamination which might result. Such authorization would also provide a

46. W. PROSSER, *LAW OF TORTS* at 122 (3rd ed. 1964).

47. *Id.* at 122.

48. *Id.* at 529.

49. A farmer can enter onto another's land to recover his cows which have wandered away, *Chapman v. Thumblethorp*, 78 Eng. Rep. 579 (1594); the owner of a bridge span which has been carried off by a flood and deposited on the land of another can enter the other's land to reclaim his span, *Forster v. Juniata Bridge Co.*, 16 Pa. 393 (1851); if logs become stranded by accident on a riparian owner's land, the log driver may lawfully enter and recover the logs, *Carter v. Thurston*, 58 N.H. 104 (1877).

50. *Rescue and Return of Astronauts and Space Objects Treaty*, art. V.

51. The Secretary of Agriculture is authorized and directed to quarantine any State, Territory, or District of the United States, or any portion thereof, when he shall

practical answer to the doubts which might arise as to whether a given object was in fact natural (as a meteor) or a portion of an artificial object placed into outer space. It should be noted that common law rights in meteors and other natural objects from outer space appear to vest in the landowners on whose land they impact.⁵²

Another area in which N.A.S.A. programs will undoubtedly have a great impact on private property rights is the area of earth resource satellite development. In fiscal 1969 it will spend 12.2 million dollars.⁵³ A good portion of this will be spent on surveillance by aircraft and only 4.5 million dollars is allocated to satellite sensor surveillance. Once satellite sensing is somewhat better developed, however, it seems likely that the efficiency of its surveillance will prevail over that of present aircraft programs. In his paper, *Legal Aspects of the Use of Satellites in Discovering and Exploiting Earth Resources*,⁵⁴ Professor Howard Taubenfeld listed a number of uses of surveillance satellites and discussed some of the international ramifications of their use. The first two he listed are of extreme importance for private property interests in the United States.

"The geological reconnaissance of remote areas, including economic studies in the search for and appraisal of formations indicative of minerals, fuels, including oil, and water resources.

"Forestry and agriculture, including the search for patterns and coloration indicating health and disease among crops, trees, etc. and to make inventories of crops."

Since it is possible by remote sensing to obtain a far better impression as to many of these important resource questions than it is by terrestrial examination, the impact of the information on the value of land held primarily for exploitation of its resources is self-evident. While the question of what to do with such information obtained about resources in foreign countries is a policy question left open to future determination by diplomatic discussion, domestic use of information may already be predetermined by extant legislation. This legislation, the Freedom of Information Act,⁵⁵ is, in my view, wholly inadequate for dealing with the potential economic impact of the availability of such information to private sources. The act expressly provides in a fairly absolute form for the release of governmental information at the request of members of the public. The basic mandate is to

determine that such quarantine is necessary to prevent the spread of a dangerous plant disease or insect infestation, new to or not theretofore widely prevalent or distributed within and throughout the United States

7 U.S.C. § 161 (1964).

52. *Goddard v. Winchell*, 86 Iowa 71, 52 N.W. 1124 (1892).

53. *Seeking a Better View*, BLS. Wk., July 13, 1968, at 118.

54. Taubenfeld, *Legal Aspects of the Use of Satellites in Discovering and Exploiting Earth Resources*, American Institute of Aeronautics and Astronautics Paper No. 68-921 (1968).

55. 5 U.S.C. § 552 (1964).

release information unless provisions of the Act specifically exempt that type of information from disclosure. While undoubtedly some consideration was given to the importance of confidentiality of information, the exemptions seem wholly inapposite to the problem here considered. An exemption exists for trade secrets and commercial and financial information obtained from a person in privileged or confidential form. Since remote sensing information would not be obtained from a person, even if it might be considered privileged or confidential for policy reasons, it would seem beyond this exemption. The only other exemption that could apply is the last of the nine exemptions which allows the withholding of information concerning geological and geophysical information and data concerning wells⁵⁶ (an evident effort to prevent information about oil deposits from being broadly circulated). The latter exemption probably is more harmful than helpful with respect to keeping earth resource information other than that concerning "wells" from public scrutiny, in that, by its specificity, it seems to indicate a consideration of resource information and by its limitation to exclude all information not specifically related to wells.

It takes little imagination to see the havoc that could be raised by the more resourceful entrepreneurs who could demand earth resource information and speculate in land on the basis of their governmentally provided information. Quite evidently the Freedom of Information Act should be amended at an early time to regularize the release of information about earth resources in some way that would not give a competitive speculative advantage to one group in favor of another.

Even jumping that hurdle, however, does not alleviate the certain impact of a sudden wave of new information which would destroy the speculative value of barren land held primarily because of the value of resource potential. Perhaps those unfortunates who hold speculative interest in land must give up their investment in the name of progress, but they will surely not do it without complaint. In the long run, there can be no doubt about the societal utility of additional information concerning the existence of resources in the United States.

IV

These bits and pieces of legal housekeeping are, of course, financially trivial when compared with the wider responsibility of government in the event of a space disaster of a sort which fortunately we have not yet experienced. The United States has accepted, in principle, the concept of national responsibility for damage caused by space vehicles internationally.⁵⁷ It has not similarly come to grips with its responsibility nationally. The

⁵⁶ *Id.*

⁵⁷ 1966 Space Treaty, art. VII.

N.A.S.A. administrator has limited authority to settle claims arising out of the space program⁵⁸ and beyond that the Federal Torts Claims Act allows suits for some forms of negligent conduct.⁵⁹ The administrator's ability to compensate is limited by the Space Act to "meretorious" claims without defining the content of "meretorious" and is limited to a \$5,000 maximum recovery in each case, which would very likely make the Act quite inapplicable in the event of a general disaster. The Federal Torts Claims Act, which has been extensively reviewed elsewhere,⁶⁰ is primarily limited by its insistence on negligence⁶¹ and a consequent apparent immunity from strict liability for ultra-hazardous activity. While strict liability is not ruled out by the court decisions in the field, it is certainly at least a doubtful theory for recovery under the Federal Torts Claims Act.⁶² Furthermore, the Torts Claims Act exemption of "discretionary functions," for which it precludes liability, potentially applies to a great portion of the space program, exempting from liability even conduct which would under common law principles be held to be negligent. The combination suggests great difficulty indeed in making the government respond for space accidents under the Act.

It is, of course, open to Congress to redress by private legislation any damage caused in the space program. It is difficult to assess in advance how adequate such compensation would be, but certainly prior to the passage of specific legislation there is cause for anxiety in the history of prior governmental responses. During the great Texas disaster, the government was slow to act and miserly in its action.⁶³ To allow innocent injured people to run the risk of great harm with the expectation of only the Texas disaster type of relief would be viewed by many as quite unacceptable. As has been suggested by a number of writers,⁶⁴ at least in so far as the space program with its inherent dangers is concerned, it would be more appropriate for the government to arrange in advance for a system of compensation, either through insurance or through direct payment or both.

A theory of liability or a compensation scheme is only the beginning, however. A number of subsidiary questions follow that are of at least equal importance. The most pressing of these is the extent of liability to which the government will bind itself; a second, close on its heels, is the degree of proof

58. 42 U.S.C. § 2473(b)(13)(A) (1964).

59. 28 U.S.C. §§ 2674, 2680 (1948).

60. E.g., Kramer, *The Governmental Tort Immunity Doctrine in the United States*, 1790-1955, 1966 *UNIV. ILL. L.F.* 795; McCabe, *Observations on the Federal Torts Claims Act*, 3 *FORUM* 66, (1968); See generally Symposium, 26 *FED. BAR J.* 1 (1966).

61. *Dalehite v. United States*, 346 U.S. 15 (1953).

62. Jacoby, *Absolute Liability Under the Federal Tort Claims Act—Part II*, 26 *FED. B.J.* 5, (1966).

63. A. ROSENTHAL, H. KORN, & S. LUBMAN, *CATASTROPHIC ACCIDENTS IN GOVERNMENT PROGRAMS* 3, 4 (1963).

64. *Id.* at ch. VI.

that will be required to establish the victim's claim. For a house destroyed by the impact of a returning space missile, these problems are fairly easy. Where, instead, the damage claimed is more remote or less tangible, problems arise. The Rodd Field incident in Corpus Christi demonstrated that damage may be caused through electrical interference in very peculiar ways. What of electronic interference from space miscalculations? The supersonic transport cases indicate the damaging impact of mere noise. There is also the damage caused by vibrations set up by rocket launching or impact, and psychic damage which can be caused by either pure apprehension or apprehension coupled with physical impact or vibration. What about physical injury of a direct sort, such as falling and being injured, or a more indirect sort such as heart attack or still more ephemeral, psychic damage? Will pain and suffering be compensated? Perhaps the normal generosity of tort law must be tempered by limiting recovery to out of pocket loss.⁶⁵ Many other forms of non-physical impact damage exist, but these suffice to illustrate the kinds of claims that can reasonably be expected to arise.

In damage claims for space activities one is often forced to examine the pre-existing condition of the person or property injured in an effort to determine whether the damage demonstrated was proximately caused by the space activity or was, instead, an inevitable event resulting from other causes. This problem raises a mixed question of fact and policy.⁶⁶ A small amount of over pressure can as easily bring down a wall that was on the verge of collapse as a small quantum of anxiety may trigger a psychic condition that was latent. Normal principles of tort law suggest that a tortfeasor takes his victims as he finds them, and he is similarly responsible for property.⁶⁷ If in fact his acts precipitate damages because of a previously weakened condition, he is nonetheless responsible. Agents of the federal government may be somewhat reluctant to cast themselves in the mold of the classic tortfeasor, however, and courts may show some reticence as well. As a result we can expect a good deal of litigation on proximate causation where the defense lies primarily in the delapidated condition of the property or person prior to the occurrence of the space activity in question.⁶⁸ A further complication may be introduced with respect to property that is adjacent to major space activity and subjected over the course of time to repeated battering by vibration and noise. Here the last event may be trivial but the cumulative effect over time may be major. Since factually it will be very difficult to separate space-caused damage from damage caused by prior conditions, it would seem to be

65. *Id.* at 111.

66. W. PROSSER, *LAW OF TORTS* (3rd ed. 1964).

67. *Atlantic Refining Co. v. Matson Navigation Co.*, 253 F.2d 777 (3rd Cir. 1958); *Maguire v. Sheenan*, 117 F. 819 (1st Cir. 1902); *Duckett v. Clement Bros. Co.*, 375 F.2d 963 (6th Cir. 1967).

68. *Supra* note 28.

desirable to build into any compensation scheme a fairly liberal interpretation of causation so as to have the government assume the burden in the more controversial cases rather than to place that burden on the innocently injured whose capacity for investigation and litigation is likely to be far inferior to the government's.

If liability is to be less than absolute, major problems of proof will arise. If the standard for liability is to be negligence rather than strict liability (which in my judgment would be an unfortunate result) then the plaintiff will be faced with the difficult tasks not only of establishing the specific act that caused the injury but also the specifics of the causal chain that trace the mishap to the defendant. The complexity of the space program, the likelihood of the expertise residing in governmental officials with loyalties obviously not consonant with the plaintiff's claim and, in some cases, the inability to divulge information for security reasons, will all combine to make a plaintiff's burden extremely onerous. The investigation of the Apollo 204 fire suggests the near impossibility of pin-pointing specifically the negligent act causing damage. A more complex disaster would presumably be even more difficult to untangle. For someone without access to the financial resources of the federal government and to its expertise, the task would very often appear hopeless.

In commerce, partially because of considerations of this sort, the movement in recent years has been toward strict responsibility for product damage in place of the prior negligence requirement.⁶⁹ A similar basic principle for the government space program would seem appropriate. In commercial cases courts have quite commonly held plaintiff to have sufficiently established his case by demonstrating a causal link between the offending activity and his injury, leaving it to the defendant who often has access to more specific facts to untangle his part of the responsibility from other causes.⁷⁰ Again, the government might consider such principles as a standard for its own liability.⁷¹

On the basic liability question, we may have a partial solution through the back door. While the government's liability remains somewhat conjectural, the responsibility of a commercial manufacturer is being extended through the law of warranty and the law of tort.⁷² Especially in a program such as N.A.S.A.'s in which at almost every stage independent contractors are heavily involved, it seems quite likely that a non-governmental defendant can be found for most accidents who at least shares

69. Prosser, *The Fall of the Citadel*, 50 MINN. L. REV. 791 (1966).

70. *Henningsen v. Bloomfield Motors, Inc.*, 32 N.J. 358, 161 A.2d 69 (1960).

71. A sonic boom case currently leaning somewhat in their direction is *Gravelle v. United States*, Civil No. 65-25 (W.D. Okla., Filed Apr. 14, 1967).

72. See generally Donnelly, *After the Fall of the Citadel: Exploitation of the Victory or Consideration of All Interests?* 19 SYR. L. REV. 1 (1967).

as a joint tortfeasor in the responsibility for injury. This is, of course, especially true if liability is to be strict rather than dependent on negligence. A recent case in California, *Smith v. Lockheed Propulsion Co.*, is on point.⁷³ The court held the defendant liable for injuries caused by the test-firing of a solid fuel rocket on a strict liability theory. After carefully reviewing the reasons for governmental immunity, the court stated that it was unpersuaded that the fact that the defendant might shift the cost of the judgment to the government was a sufficient reason to deny liability. Lockheed was almost certainly working under a cost-plus contract and would have been able to obtain compensation from the government if its loss exceeded Lockheed's insurance coverage and did not cause costs to exceed contract limits. Although N.A.S.A. has no express authority to put indemnification provisions into its contracts, its cost-plus contracts customarily provide for the compensation of a contractor for casualty losses and liabilities to third persons in excess of insurance coverage as one of the costs of the contract.

It should be noted, incidentally, that N.A.S.A. is more restricted in this respect than several other governmental agencies. The Atomic Energy Commission,⁷⁴ the military,⁷⁵ and the Public Health Service,⁷⁶ insofar as research and development contracts are concerned, are expressly authorized to include indemnification provisions in their contracts. N.A.S.A. may, at best, rely on the provisions of Public Law 85-804⁷⁷ which allows indemnification of activities in connection with the national defense when authorized by the President during a time of national emergency. By executive order, P.L. 85-804 has been limited to payments that may be made within the limits of appropriated funds. This requirement as well as other technical questions raise ambiguities in interpretation of the provision. It has consequently been the position of N.A.S.A. that such authority ought not to be used and that the Space Administration should instead continue to press for general indemnity authority.⁷⁸ The result of all of this is that fixed-fee contractors must compensate for loss out of their own insurance. In the event that the loss exceeds their insurance coverage and assets, the victims would presumably be without compensation. Since, as has been mentioned, most of N.A.S.A.'s contracting in the field of space missiles has been on a cost-plus basis, the problem may be more academic than real in the case of minor damage. For major disasters, contract cost limits would, of course, bar adequate compensation. In any event, the House Government Operations

73. 247 Cal. App. 2d 774, 56 Cal. Rptr. 128 (1967).

74. 42 U.S.C. § 2210 (1964).

75. 10 U.S.C. § 2354 (1964).

76. 42 U.S.C. § 242(b) (Supp. II, 1967), *amending* 42 U.S.C. § 242(b) (1964).

77. 50 U.S.C. §§ 1431-1435 (Supp. 1969).

78. N.A.S.A. Procurement Reg. 10.350, C.C.H. TOPICAL L. REP. 68,836.

Committee is presently studying the question and present reports suggest their sympathetic attention to the problem.⁷⁹

It should be added that, whatever ultimately comes of the question of compensation to disaster victims, some provision of the sort contained in the Price-Anderson Act,⁸⁰ which governs atomic energy indemnification, should certainly ultimately appear in the law to deal with interim relief immediately needed for disaster victims. This result will not be reached merely by extending indemnification in principle.

Overall, it would appear best for the government to assume directly the liability rather than further to adjust the specifics of indemnification and to hold the contractors involved in governmental operations responsible solely to the government and immune from suit from third parties. I recommend this solution primarily for the sake of efficiency in compensating victims.

V

Not only is it necessary that N.A.S.A. make its peace with private interests in land, but it must also obtain the necessary authority from the relevant jurisdiction for the use of air space that has not already been committed to it by the federal government. This presents a few present problems and promises to present a number of additional problems in the future. Of necessity the space program makes demands on the space super adjacent to foreign states. In the present form of the space program there appears to be fairly general agreement on the extent to which national claims to super adjacent space are legitimate.⁸¹ Thus, the use of super adjacent space for orbital missions appears immunized by the consensus that has existed since the flight of the first Sputnik.⁸² By contrast the air space that will be occupied by supersonic transports remains in the national jurisdiction of the country flown over.⁸³ It is possible to continue orbital missions without permission; it is illegal to make aircraft flights, supersonic or otherwise, without prior national permission. The dividing line between the area in which national sovereignty exists and the altitude at which free use of outer space begins has been the subject of much prior discussion.⁸⁴ It is safe to say that there is no agreement on where it should exist and, for that matter, on how quickly the question should be solved.⁸⁵ The United States has taken the

79. HOUSE GOV'T OPN'S COMM. REPORT, GOV'T CONTRACTOR INSURANCE PROBLEMS, H. R. REP. NO. 1580 90th Cong., 2d Sess. (1968).

80. 42 U.S.C. § 2210 (1964).

81. Cooper, *High Altitude Flight and National Sovereignty*, *supra* note 4.

82. Pepin, *Legal Problems Created by the Sputnik*, 4 MCGILL L.J. 66 (1957).

83. Craig, *National Sovereignty at High Altitudes*, 24 J. AIR L. & COM. 384 (1957).

84. Hogan, *Legal Terminology for the Upper Regions of the Atmosphere and for the Space Beyond the Atmosphere*, 51 AM. J. INT. L. 362 (1957).

85. Cooper, *Fundamental Questions of Outer Space Law*, reprinted in LEGAL PROBLEMS OF SPACE EXPLORATION, S. DOC. NO. 26, 87th Cong. 1st Sess. 764 (1961).

position that the question should be postponed awaiting further technological information.⁸⁶ Nonetheless, the plans for a hypersonic transport, which might well partake of present national air space and the area conceived as lying in outer space, does press the question of a definition of national sovereignty.

As has been previously mentioned, within the United States N.A.S.A. need concern itself not only with national air space which it is free to use but also with the subadjacent property owners' rights where his air space or terrestrial realty is affected by the space program. Between the national sovereignty and individual property rights several municipalities are asserting a zone of interest of their own. Thus the city of Santa Barbara on September 26, 1967, adopted Ordinance 3246⁸⁷ which prohibits sonic booms over its city. The town of Hempstead, New York, passed an ordinance⁸⁸ prohibiting the level of noise which it was then experiencing from the use of New York airports. While the former ordinance has not been tested, the Second Circuit has in a recent decision held the Hempstead ordinance to be a violation of federal rights in the national air space.⁸⁹ It seems likely that the Second Circuit's view will prevail and that municipalities will be held incapacitated to alter authorized use of federal air space. However, the fact that this avenue was unsuccessful will not likely dissuade municipalities in their attempt to find a method of protecting their constituents.

N.A.S.A. also has unique personnel problems. Here the distinguishing features between the civilian N.A.S.A. and the military are perhaps most pronounced. Although operating in an extremely sensitive field, like the military, the Administration must manage civilians on a civilian base of operation according to civilian concepts of individual freedoms. It should also be recognized that N.A.S.A. properties are held, on the whole, with no greater title in the federal government than would exist in a private landowners occupying the same space. The instances of federal jurisdiction are rare indeed. Thus, the law enforcement policy must accord with the pattern authorized under the relevant state law. Penalties for many types of infractions must be left to local rather than national courts and a military-like demand for automatic respect for authority cannot readily be enforced. It is much to N.A.S.A.'s credit that, to my knowledge, these facts have not adversely affected its operations. Judging from its prior acts it will probably continue to attempt to accomodate its own program to the needs of the municipalities and states in which various facilities are located and the result will continue to be mutually beneficial. The accomodation of the

86. See generally *Remarks of Sen. Thomas E. Martin*, *supra* note 85, at 749, 752, 753. The attitude is broadly shared. Cheng, *Problems of Space Law*, *supra* note 85, at 666, 667.

87. Santa Barbara, Calif., Ordinance 3246 (1967).

88. Hempstead, New York Unnecessary Noise Ordinance No. 25, art. II, *as amended*, March 10, 1964.

89. *American Airlines v. Town of Hempstead*, 160 N. Y.L.J. 41 (1968).

Corpus Christi community to the zoning needs of the Rodd Field tracking station is a good illustration of how effective such relationships can be.

Because of the close ties just mentioned, it seems quite likely that N.A.S.A. will make available to the needy in an adjacent municipality its special facilities for dealing with specialized kinds of medical problems and special forms of disaster relief. To be sure, this imposes a liability on N.A.S.A., acting as a "good samaritan," to the same extent that good samaritans are penalized in general by our law that distinguishes between misfeasance and nonfeasance.⁹⁰ The only liability assumed, however, is liability for negligence and that ought not to be financially very great. On the other hand, a more cautious policy which would restrict use of the equipment with the capacity to save life or prevent great property loss when no comparable equipment exists in the surrounding community, would not only strike many as offensive but would also probably go a long way towards destroying the cooperative relationship which appears so important to continued N.A.S.A. activity.

VI

Because so many questions about human tolerance to conditions of outer space are unknown and because much of the equipment that will be used to explore space is still quite experimental, the need for human experimentation is extremely great in N.A.S.A. In consequence, much consideration must be given to the common law prohibition against experimentation on human beings⁹¹ and consequent legal and humanitarian problems. Indeed, the time may be ripe for a government-wide experimentation regulation either by legislation or otherwise.

The single most important prerequisite to be considered is the informed consent of the subject, which is a condition clearly imposed by common law⁹² and perhaps strengthened by the Nuremberg trials.⁹³ At the same time, while consent should be required for the experiment and while it is essential that the subject understand the risks he is to run with sufficient specificity,⁹⁴ the

90. See generally W. PROSSER, *LAW OF TORTS* § 54 (3rd ed. 1964), Bohlen, *The Moral Duty to Aid Others on a Basis of Tort Liability*, 56 U. PA. L. REV. 217 (1908).

91. *Carpenter v. Blake*, 60 Barb. 488 (1871), *rev'd on other grounds*, 50 N.Y. 696 (1872). Although not a true experimentation case, it has become the leading case in the field. See note, 40 CALIF. L. REV. 159, 160-61 (1952).

92. Lack of consent will open the experimenter to assault charges. See *Perry v. Hodgson*, 168 Ga. 678, 148 S.E. 659 (1929); *Tabor v. Scobee*, 254 S.W.2d 474 (Ky. 1952); *Franklyn v. Peabody*, 249 Mich. 363, 228 N.W. 681 (1930).

93. *United States v. Brandt (The Medical Case)*, 2 TRIALS OF WAR CRIMINALS BEFORE THE NUREMBERG MILITARY TRIBUNALS UNDER CONTROL COUNCIL LAW NO. 10 (1949). The United States Military Tribunal started off its code on human experimentation with the statement that "[t]he voluntary consent of the human subject is absolutely essential." *Id.* at 181.

94. Problems of the experiments which require that the subject be kept in ignorance of

consent given should not be used by the government to defeat a claim by the subject for any damage that arises out of the experiment. While at common law such consent might very well be taken as voluntary assumption of the risk,⁹⁵ for obvious reasons in the space program injury should be treated as a contract cost and the subject should be fully compensated. To insure that the risks are fully understood and as fully described to the subject as possible, it seems desirable to have a screening board established in advance of the experiment to assure that there has been a proper consideration of the rights and welfare of the subject, that he has given *informed* consent, and that the risks warrant running the experiment.⁹⁶ Finally, it might be a good idea to provide a physician in the experimental setting itself to monitor the continuation of the experiment, assigning him the responsibility of insuring the safety of the subject and giving him the requisite authority to end the experiment when it becomes inappropriately dangerous.⁹⁷

The common law cases that deal with human experimentation are still cases from a prior age. They are, on the whole, medical quackery cases or cases of over-enthusiastic physicians but not cases that arise out of the legitimate needs of experimentation.⁹⁸ Consequently, N.A.S.A. cannot rely on precedent to describe its duties and must develop its own policy unless a broader governmental policy is established. An express experimentation policy is in operation at the Ames Research Center in California, but no similar agency-wide provision is known to me.

Another area in which more than usual demands are going to be made on human resources will be the lunar receiving laboratory to which the astronauts will return after they have visited the moon and in which they will be quarantined along with a staff of scientific and other personnel during a time interval sufficient to insure that no back contamination will take place on their release or on the release of lunar samples. The scientific plans for this community of the quarantined have been very carefully made. Some legal plans have also been made but a few loose edges appear to remain. Both the Department of Agriculture⁹⁹ and the Public Health Service¹⁰⁰ have

their purpose raise additional problems which may of necessity be covered by a more blanket form of consent

95. *Atchison, T. & S.F.R. Co. v. Schroeder*, 47 Kans. 315, 27 P. 965 (1891) (employee knew all of the dangers involved); *Loynes v. Loring B. Hall Co.*, 194 Mass. 221, 80 N.E. 472 (1907) (risk involved in running this machine was obvious); *Talbot v. Sims*, 213 Pa. 1, 62 A. 107 (1905) (employee knew of defect in machine).

96. See Public Health Service Bulletin for the Protection of the Individual Subject of Investigation, U.S. Dept. of Health, Education and Welfare, March 1968.

97. Mulford, *Experimentation on Human Beings*, 20 STAN. L. REV. 99 (1967). Mulford stated that the Ames Research Center presently has such a monitor with the power to end the experiment if it becomes too dangerous. *Id.* at 109.

98. E.g., *Jackson v. Burnham*, 20 Colo. 532, 39 P. 577 (1895); *Sawdey v. Spokane Falls & N. Ry. Co.*, 30 Wash. 349, 70 P. 972 (1902); *Allen v. Voje*, 114 Wisc. 1, 89 N.W. 924 (1902).

99. Plant Quarantine Act, ch. 308, § 8, 7 U.S.C. § 161 (1964).

100. 42 U.S.C. § 264(b) (1964).

statutory responsibility for the quarantining of plants, live stock and minerals, and even human beings under specific circumstances in which they would represent a health hazard to the rest of the population or its economy. Both agencies have agreed to participate on an inter-agency committee on back contamination and they will be joined by representatives of the Department of the Interior which has responsibility for wildlife and fisheries,¹⁰¹ the National Academy of Sciences and six N.A.S.A. representatives (which, incidentally, gives the Administration a majority position on the inter-agency committee of eleven). It is not clear whether the participation of the agencies other than N.A.S.A. in the advisory capacity of the inter-agency committee on back contamination is thought by the respective departments to shift to the Administration their obligations under federal legislation imposing on them specific responsibility for preventing domestic contamination. If it is, it remains unclear to me whether, under present federal law, the departments are authorized to so delegate their responsibilities. In the event that they have not agreed on a corporate decisional process, the spector of conflicting determinations with respect to the release of those contained in the lunar receiving laboratory suggests the need for some regulation in advance of the fact to determine such questions.

After resolving the questions concerning the sharing of responsibility for preventing contamination, there remains the question of the authority for keeping in quarantine a fairly substantial group of people. In addition to the astronauts, a number of supporting workers will be quarantined for the same period. Furthermore, in the event that there is any leak in the seal of the quarantine perimeter arrangements have been made to extend it to include those potentially contacted through the leak. It is therefore quite possible that the quarantine will extend physically beyond the area now intended and will include a greater number of people than is considered ideal.¹⁰² Also, though there are present projections for a fairly short term confinement of about twenty-one days, that period may be extended depending on the findings. The threat of time extension appears fairly realistic in light of the fact that the search will essentially be directed at finding traces of a form of contamination that is yet unknown and which in all probability doesn't exist. A search for that kind of contamination may take longer than originally planned.

It seems essential that all personnel in the primary quarantine area have given prior consent to their confinement. This follows not only from their possible ability to challenge the legality of the quarantine but also, more significantly, from their obvious need to make arrangements for such an

101. Fish and Wildlife Act, ch. 1036, § 2, 16 U.S.C. § 742(a) (1964).

102. Following the return of Apollo XI, minor accidents in the examination of lunar material has necessitated the addition of several supporting workers, including two technicians and a secretary, to those already quarantined with the astronauts.

extended stay. Furthermore, since the quarantine may conceivably involve dangers not yet known, the informed consent provisions of human experimentation would seem the most appropriate standard to apply in obtaining their knowledgeable acquiescence for participation in lunar receiving laboratory activities. While the dangers anticipated are not experimental and may be more analogous to high risk employment as, for example, being a test pilot, the fact that the employee pool will consist of persons not accustomed to considering their jobs hazardous suggests the need for their informed consent. The same form of prior consent ought probably to be obtained from those whose duties will take them into the periphery of the quarantine area from which they may conceivably find themselves drawn into quarantine in the event of a defect in the quarantine seal. Furthermore, as an additional legal precaution quarantine regulations ought to be made specifically applicable to the problems of back contamination from the moon. While the Department of Agriculture has broad authority to quarantine articles "of any character whatsoever capable of carrying any dangerous plant disease or insect infestation,"¹⁰³ the Public Health Service is limited in its quarantine authority over human beings to "such communicable diseases as may be specified from time to time in Executive Orders of the President on the recommendation of the National Advisory Health Council and Surgeon General."¹⁰⁴ The back contamination problem is surely not covered by communicable diseases identified by prior Executive Order and may, indeed, be incapable of the kind of specification presently anticipated in the authority. Consequently, either N.A.S.A. or the Public Health Service appears in need of a legislative grant of authority to quarantine against moon contamination.

Even so, informed consent appears an extremely desirable addendum to quarantine power. Traditional quarantine theory will hardly support the present form of quarantine. A few cases have held quarantine to exceed the power of the state; for example, *Ex Parte Shepard*,¹⁰⁵ in which a writ of habeas corpus released from custody a lady suspected of having venereal disease. The quarantine cases which legitimate the involuntary detention for public health purposes, uniformly assume a fairly specific type of ailment and a reasonably probability of infection.¹⁰⁶ In case of lunar contamination specificity is of course impossible and the probability of infection so low that it would not be considered significant except for the fact that the uncertainty itself raises the specter of extreme danger.

The lunar receiving laboratory also illustrates the fact that as the space program continues a number of micro-societies will be created from time to

103. *Supra* note 100.

104. *Supra* note 101.

105. 51 Cal. App. 49, 195 P. 1077 (1921); *People v. Robertson*, 302 Ill. 422, 134 N.E. 815 (1922); *Rock v. Carney*, 216 Mich. 280, 185 N.W. 798 (1921).

time for specific purposes. In this case, the duration will be short and the work to be performed not of the type in which inefficient performance or work stoppage would be devastating. In the event that a medical crisis does develop however, the receiving laboratory society would quickly be altered to a place in which order and stability would be of prime importance and there would be a significant need to insure good performance by all concerned. The penthouse experiments have already demonstrated that small closed societies generate their own antipathy to law.¹⁰⁷ Civilian activities at space centers are subject to labor disputes, refusals to perform, and other problems which could operationally be impossible to resolve until the purpose of the particular mission is concluded in this case until the quarantine could effectively be broken in other cases later in the space program, until terrestrial contact was re-established. It would seem that for the operational aspects of the space program the discipline of the civilian maritime service is the minimal standard. In the maritime service, while most individual rights are retained, certain accommodations are made with respect to work stoppage and otherwise¹⁰⁸ because of the obvious need of a ship at sea to be in firmer disciplinary control than the normal civilian operations. The heart of those regulations would appear to be the anti-mutiny provision.¹⁰⁹ Its validity and significance have both given the Supreme Court's imprimatur in a work-stoppage case.¹¹⁰ I would suggest a similar provision to be an appropriate addendum to the authority presently granted to N.A.S.A.

The domestic legal problems facing the United States' space program are, admittedly, not problems of grand proportions but they are real and serious nonetheless. What's more, they will not patiently await studied answers once the contingencies manifest themselves. If answers are to be better than make-shift, they should come soon. We at the Syracuse project hope we can be involved in finding them.

106. *E.g.*, *State v. Hutchinson*, 246 Ala. 48, 18 So. 2d 723 (1944); *Ex Parte Martin*, 83 Cal App.2d 164, 188 P.2d 287 (1948); *Hill v. Hilbert*, 92 Okla. Crim. 169 (1950); *Kennedy v. Head*, 182 Tenn. 249, 185 S.W.2d 530 (1945).

107. Walter O. Weyrauch, *The Law of a Small Group, A Report on the Berkeley Penthouse V*, Space Sciences Laboratory, University of Cal., Berkeley, at 22-24, 62-63 (1967).

108. Shipping Articles, 46 U.S.C. § 564 (1964).

109. Mutiny Act, 18 U.S.C. §§ 2192, 2193 (1964).

110. *Southern Steamship Co. v. N.L.R.B.*, 316 U.S. 31 (1942).